of plates requisite for complete polarization of the *transmitted* beam is 30: and since, under these circumstances, the whole of the light that is not reflected at the first surface is transmitted through the whole series, the author observes, that transmission is not in this case a maximum at a perpendicular incidence, and that the law employed by Bouguer fails by reason of these newly-discovered properties of light, of which that distinguished philosopher was not aware.

The celebrated discovery of Malus, of the polarization of light by oblique reflection, and its connexion with the properties of doubly-refracting crystals, is perhaps the most important discovery that has been made in optics since that of the principle of the achromatic telescope; but the author observes, that it does not furnish us with any information of the manner in which these crystals effect polarization, and that the present discovery of polarization by oblique refraction supplies the connecting link between these two classes of facts, and holds out a prospect of a direct explanation of the leading phenomena of double refraction.

Should the present paper meet with the approbation of the Society, Dr. Brewster promises a further communication of experiments on the polarization of light by reflection, in which he designs to show that the law observed by Malus is not general, and that the principle has been completely overlooked by him; as it depends on the proportion which the quantity of light reflected bears to that which is transmitted when incident at the polarizing angle. When light is incident upon water at the polarizing angle, he remarks that only $\frac{41}{1000}$ is reflected; that even from glass only $\frac{75}{1000}$ is reflected; but when realgar, diamond, or chromate of lead are employed, then at the polarizing angle these bodies reflect as much as one half of the light, and consequently have not power to polarize all that they reflect.

Further Experiments on the Light of the Cassegrainian Telescope compared with that of the Gregorian. By Captain Henry Kater, *Brigade-Major. In a Letter addressed to the Right Hon. Sir* Joseph Banks, *Bart. K.B. P.R.S.* Read November 18, 1813. [*Phil. Trans.* 1814, *p.* 231.]

The experiments detailed in the present letter were conducted exactly in the same manner as those detailed by Capt. Kater in his former communication, for the purpose of comparing a new Cassegrainian telescope, made by Mr. Crickmore of Ipswich, with the Gregorian used in the former experiments. The diameter of the large speculum in this instrument is 4·9 inches, but was reduced by a ring of pasteboard to 3·6, in order to render the illumination equal to that of the Gregorian, in which the large speculum measured 3·95 inches.

The areas exposed to the light being estimated at 7·152 and 10·593, and the magnifying powers at the same time being 157 and

125 respectively, the illuminating powers of the two telescopes are inferred to be as 678 to 290.

The mean of this and the two former experiments, without making allowance for the imperfect polish of the Cassegrainian in one of them, gives the comparative superiority in the illuminating power of the Cassegrainian more than 2 to 1; or if the experiment which the author considers less perfect be rejected, it would appear to be $2\frac{1}{3}$ to 1 in favour of the Cassegrainian construction.

Astronomical Observations relating to the sidereal part of the Heavens, and its Connexion with the nebulous part; arranged for the purpose of a critical Examination. By William Herschel, *LL.D. F.R.S.* Read February 24, 1814. [*Phil. Trans.* 1814, *p.* 248.]

In a former communication to the Society, the author endeavoured to show the probability of a progressive condensation of nebulous matter, so as to put on ultimately the appearance of stars: his present object is to show, by reference to select cases from many thousand former observations on record, that a similar operation of gradual condensation is also taking place among condensed clusters of visible stars, and consequently to render it probable that an intimate connexion subsists between these extremes, and that the same process of condensation continues from one end of the series to the other; so that the most perfect stars may possibly have originated from an accumulation of mere nebulous matter.

His first observations, indeed, relate to a more direct communication between present stars and contiguous nebulosity in different relative positions. In some instances a single star appears to be attracting to itself a branch of nebulosity, seen extending from one of its sides; in others, two adjacent stars appear to have equal power over a linear portion of nebula that extends from one to the other.

The portions of nebula, however, that are adjacent to different single stars, vary considerably in their appearance. Of those nebulous branches that extend only on one side, some have parallel sides, some are fan-shaped, others are in a considerable degree irregular. Some stars have extended nebulosity on opposite sides, in a line of which they occupy the centre. Round others it appears diffused equally, as in a globular form, on all sides; and in some instances, such a globular nebula apparently includes a cluster of several stars together. All these appearances afford a presumption, that stars and nebulæ are drawn together by mutual attraction, and that the accession of such a quantity of matter as must be contained in an extensive nebula will ultimately cause what may be called the *growth* of stars. What in its first state appeared as a globular nebula alone, would, by condensation, present the appearance of a nucleus in its centre. The globular nebula with nucleus would, by increasing condensation, become a nebulous star; its next state would be that of a distinct star, with surrounding nebulosity; and the last result would be the perfect simple star.